Reconstruction of Mid-Facial Defect Secondary to Rhinomaxillary Mucormycosis: Report of a Challenging Case and Literature Review

Andrea Torroni1*, Fabio Romano2, Giuliana Longo2, Giuseppe Lombardo2
Department of Oral and Maxillofacial Surgery, Bellevue Hospital, USA

Abstract

Mucormycosis is a potentially fatal infection by fungi of the class of Zygomyetes that affect preferentially individuals with uncontrolled diabetes mellitus or other conditions of immunodeficiency. Here is presented a case of rhinomaxillary mucormycosis in a relatively young female patient affected by diabetes mellitus and severe psoriasis, that resulted in a wide necrosis of the mid-face involving the bone, the overlying teguments, and part of the nasal pyramid. Objective of the manuscript was to highlight and discuss the intrinsic difficulties faced in planning the reconstruction of this major tissue defect, even in consideration of the underlying co morbidities; the authors found that the use of local flaps represented the best reconstructive choice to obtain a satisfactory aesthetic result while limiting the risk of reconstructive failure. A rotation cheek flap (Mustarde’ type) combined with an interpolated left paramedian forehead flap were used to reconstruct the maxillo-molar and nasal regions respectively, the procedure was easily performed and well tolerated by the patient; the recovery was uneventful and carried a complete satisfactory aesthetic and functional result. This experience could serve as guide and example for surgeons who might face similar challenging situation in their practice.

INTRODUCTION

Mucormycosis is the common name given to an opportunistic infection by fungi of the Mucorales order [1-5]. The most important predisposing factor for mucormycosis is uncontrolled diabetes mellitus (DM); other predisposing factors are represented by conditions of immunodeficiency such as: malignancies and leukemia, long term steroid and/or immunosuppressive therapy, malnutrition, AIDS [1-4].

Clinically, six forms of mucormycosis were described: rhino cerebral, pulmonary, cutaneous, gastro enteric, disseminated, and miscellaneous; rhinomaxillary mucormycosis is a subtype of the rhino cerebral form, characterized by involvement of bone and soft tissue of nose and cheek area without progression to orbit and brain [1,5,6].

The treatment of mucormycosis encompasses three fundamental steps: 1) prompt reversal of underlying predisposing conditions (e.g. aggressive correction of hyperglycemia and ketoacidosis); 2) surgical debridment of necrotic tissues, that may interfere with diffusion of systemic antifungal chemotherapeutics; 3) antifungal system chemotherapy using amphotericin B or, if contraindicated, posaconazole [5,7,8].

Prognosis depends on several factors including: timing of diagnosis and management, general health of patient, infection location; for rhinocerebral mucormycosis, survival rate is up to 80% in cases without brain involvement (rhinomaxillary subtype), whereas fall down to less than 20% if there is cerebral spread of the infection (rhino-oculocerebral form) [9]. Despite the relatively high survival rate of rhinomaxillary mucormycosis, however, the result of massive necrosis of bone and soft tissues in the central portion of the face may result in severe esthetic and functional impair, with heavy impact on the patient’s quality of life.

We present a case of rhinomaxillary mucormycosis in a female patient affected by poorly controlled DM and cutaneous psoriasis under steroid treatment, the aim of this report is to focus the attention on the challenging reconstruction of the naso-maxillary region in this unfortunate patient.
CASE PRESENTATION

Informed consent to publish clinical record and photos respecting the anonymity has been obtained by the patient prior of performing any intervention and publishing the case report. Due to the retrospective nature of the report, this study did not required review and approval from Institutional Ethic Board.

M.R. female 58 year-old affected by DM type II and psoriasis treated with cephalosporine 250 mg/die p.o. From July 15th 2014 started having fever (38-38,5°C) and pain over the upper dental arch on the left side. Rx orthopantomography showed mild shading of the left maxillary sinus without evidence of teeth pathology (Figure 1). Subsequently she developed redness and swelling of the left emi-face along with left ocular proptosis and paresthesia of the left upper lip (Figure 2). The symptoms worsened over time despite symptomatic treatment with antibiotics (amoxicillin + clavulanic acid 875-125 mg p.o. twice a day) and acetaminophen (1 gr p.o. q 8 hrs), and the patient noticed spreading of the anesthesia over the left nasal ala and the skin of the ipsilateral cheek. She was admitted in hospital on July 23th and underwent hematological tests, MR and CT scan; the glycemic value was 720 mg/dl, the CT scan showed “…left maxillary sinusitis associated with left orbital cellulitis.” The patient was treated with i.v. hydration and insulin infusion to control the diabetes, broad spectrum i.v. antibiotics (metronidazole and amoxicillin + clavulanic acid) and scheduled for sinusal endoscopic biopsy. Diagnosis of Mucormycosis granulomatous infection was confirmed by H&E (hematoxilin and eosin) and PAS (Periodic acid Shiff) stains of the specimen that showed non-septate fungal hyphae branching at right angle embedded in connective and necrotic tissue. Following the histological diagnosis the patient was administered i.v. antifungal therapy with amphotericin B 0.8mg/kg/day for two weeks. Despite the therapy the local condition worsened and the patient developed necrosis of the left cheek soft tissue and left nasal pinna (Figure 3).

Once the blood sugar level was controlled and the infection subsided the patient underwent surgical debridement of the necrotic tissue under general anesthesia in another Hospital. No primary reconstructive procedures were attempted in order to monitor the status of the infections and proceed with further local debridement at follow-up visits.

The patient was assessed at our Institution on September 27, about two months from the beginning of symptoms and 10 days after surgery. The physical exam showed a wide defect of skin and underlying bone interesting the left maxilla-malar region extended to the ipsilateral nasal pinna (Figure 4). The margins of the tissue defect were healed producing a marked scar retraction.
that determined left lagophtalmus and ectropion of the left lower lid. Neither evidence of necrotic tissue nor signs of persistent infection were detected at the time of our first visit. The intraoral examination was unremarkable.

The patient underwent a two-step reconstruction surgery: during the first stage a left trans positional cheek flap (Mustarde' flap) (Figure 5) was used in combination with a left paramedian interpolated frontal flap (Figure 6) to reconstruct the cheek defect and the nasal defect respectively; the second operation, planned three weeks following the first step procedure, aimed at sectioning the pedicle of the frontal flap, remodeling the nasal and left eyebrow regions, and preforming a left medial cantopexy (Figure 7). Both the procedures were uneventful and managed with an overnight hospital admission. The patient was kept under antibiotic therapy (Amoxicillin and clavulanic acid 875/125 mg twice a day for 7 days) and analgesic (Acetaminophen 1gr per os if needed). A regular follow-up with weekly clinical assessment and dressing of the wounds was maintained for two months postoperatively. None of the transposed flap showed signs of sufferance at any time and the wound healing was uneventful (Figure 8).

**DISCUSSION**

Mucormycosis is a potentially lethal opportunistic infection by fungi of Mucorales order, class Zygomycetes; this microorganisms are usually saprophytic and may be cultured from upper airways and stools of asymptomatic healthy individuals.
Diabetes mellitus and other conditions that impair the normal immune response, however, create favorable condition for these pathogens to become virulent and determine acute necrotizing infections [1-9].

Several reports have shown as uncontrolled DM may cause impairment of granuloeyte phagocytic ability and polymorph nuclear granulocyte response, compromising the first line of defense of the naso-sinunasal mucosae [1,6]. Other factors contributing to the progression and aggressive spread of mucormycosis in diabetic patients are represented by the increased availability of nutrients such as free iron (released by proteins in condition of metabolic acidosis), and ketone bodies which were used as nutrition by some species of fungi (i.e. Rhizopus arrihzus) through the production of ketoreductase enzymes [6,8,9].

The pathogenesis of bone and soft tissues necrosis in cerebromaxillary mucormycosis is due to the capability of fungi hyphae to form intraluminal thrombi that occlude small vessels creating hypovascularity and, eventually, necrosis of tissues; the peripheral microangiopathy induced by DM and prolonged steroids use, both present in our patients, might contribute to favor and enhance this process [1,6-9]. Another factor often associated with spread of mucormycosis infections is a previous history of surgery with delayed healing of wound (usually tooth extractions in DM patients), a condition that would favor the direct penetration of fungal hyphae into the blood stream [6]; in our case, however, no dental history of previous exaction was reported, and the intra-oral examination showed unremarkable teeth, gingivae and oral lining.

An aspect which we think would worth further investigation, although scarcely reported in literature, is represented by the importance of environmental temperature as co-factor promoting the insurgence of infection; in our limited experience of rhinomaxillary mucormycosis, including the presented case and 5 more patients, we noted that this kind of infection arose preferably on Summer season, in conditions of higher temperature and humidity (>25°C). Such an observation, along with the fact that the majority of reports of mucormycosis were from country with seasonal hot weather (India [1,5-9], Mexico [10], Saudi Arabia), may suggest that the warm climate would represent a further co-factor in promoting the growth and virulence of such, otherwise saprophytic, species of fungi. Unfortunately, none of the reported series highlighted specifically either the time when the infection occurred, or the climatic condition, leaving our observation on the field of mere hypothesis needing validation on evidence-based ground.

There are several clinical forms of mucormycosis infection depending whether the spores were inhaled (rhino cerebral, pulmonary forms), or ingested (gastrointestinal); in uncontrolled diabetic patients the most frequent form is rhino cerebral [12]: the symptoms of this form range from the isolated necrosis of the maxilla, with oronasal-sinusal fistula, to necrosis of overlying teguments of midface, up to the more severe orbital and cerebral involvement secondary to thrombosis of retinal vessels, cavernous sinus, Internal Carotid artery and Internal Jugular vein (Lamierre syndrome) [1,6,8,12]. In our case the patient had a peculiar clinical presentation characterized by massive tissue necrosis on the left rhino-maxillary region, without intra-oral signs of infection, and with limited orbital involvement, mostly secondary to the downward retraction of the lower eyelid by the scarring process (ectropion and epiphora).

As consumptive, the patient was suffering mainly of a severe aesthetic damage, with rather mild functional discomfort.

Once reassured on the stable systemic conditions and control of infection, we focused our attention on the best way to reconstruct the defect in order to achieve a complete aesthetic and functional recovery, even considering the relatively young age of the patient. Although the gold standard option to repair wide and complex defects of the face is represented by free flaps, as already reported in similar cases [13,14], we thought that the use of micro vascular technique would have been at high risk of failure, due to the underlying precarious micro vascular condition; moreover, we considered that the absence of oronasosinal communication and masticatory deficit would lighten partially the burden of reconstruction, avoiding the challenge of recreating the upper alveolar process. Our reconstructive choice was directed on the most reliable local flaps; in planning the reconstruction great attention was place in respecting the different aesthetic region of the face: the translation Mustarde’ flap was chosen for reconstruction of the sub-orbital and cheek region, whereas an interpolated left paramedian forehead flap was selected to reconstruct the nasal defect.

The correction of the ectropion was initially addressed by simple debridging of the suborbital scar tissue during the transposition of the Mustarde’ flap, but unfortunately the problem persisted due to the upraised laxity of the medial canthus and inferior tarsal plate; as that, we decided to fix the problem in a second step by mean of a medial canthopexy, which was performed three weeks following the first surgery, along with the forehead flap’s pedicle separation.

The aesthetic result obtained was judged highly satisfactory by medical staff, patient’s relatives and the patient herself; the respect of aesthetic subunits of the face during the reconstruction, along with the similar texture and color of the recipient and donor sites contributed to a balanced and natural facial appearance. Despite the good reconstructive result, however, we found that the reconstructed nasal ala was still suboptimal: the lack of the alar cartilage support, which was purposely not replaced during the first reconstruction to reduce the risks of failure, determine the cephalad retraction and collapse of the nostril. This did not interfere with the nasal breathing of the patient who, albeit counseled, refused to undergo further surgery to address the problem by insetting a composite cartilage graft harvested from the auricular concha. In conclusion, we think that rhinocerebral mucormycosis is a potentially lethal condition that, even when cured, leaves heavy aesthetic and functional impairments. The facial reconstruction of such unfortunate patients is challenging for the wide and complex nature of the defect, and the underlying systemic conditions that could jeopardize the successful outcome of micro vascular reconstructions; in such cases the use of local flaps has the double advantage of higher reliability, and excellent aesthetic outcome due to the similar color and texture of the skin of donor and recipient areas; for that reasons we think that the use of local flaps, alone or in combination with other option (free flap for the rhinoplasty region, whereas an interpolated left paramedian forehead flap was selected to reconstruct the nasal defect.

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flap, grafts, prosthesis, etc.), should be always be considered for reconstruction of facial defects secondary to rhinomaxillary mucormycosis.

REFERENCES


